

CLAIMS

- [1] An extracorporeal blood circulating apparatus comprising:
a closed-type venous reservoir having a blood storage chamber for
storing blood and a volume adjusting chamber for storing an adjusting liquid
5 for volume adjustment that are disposed adjacently by partitioning a closed
space formed by a housing;
an adjusting liquid tank for storing the adjusting liquid that is
connected to the volume adjusting chamber; and
a blood pump that is connected to the blood storage chamber,
10 the housing being provided with an inflow port for allowing blood to
inflow and an outflow port for allowing blood to outflow that respectively
communicate with the blood storage chamber, and an adjusting port for
injecting and ejecting the adjusting liquid that communicates with the
volume adjusting chamber,
15 the blood pump being connected to the blood storage chamber via the
outflow port,
the adjusting liquid tank being connected to the volume adjusting
chamber via the adjusting port,
wherein
20 the closed space of the closed-type venous reservoir is partitioned by a
flexible septum member so as to form the blood storage chamber and the
volume adjusting chamber, and
the adjusting liquid tank and the adjusting port are connected by a
conduit member having a configuration that can adjust a flowing amount.
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- [2] The extracorporeal blood circulating apparatus according to claim 1,
wherein the conduit member is made of a flexible tube.
- [3] The extracorporeal blood circulating apparatus according to claim 1,
30 wherein the conduit member comprises a channel adjusting portion for

changing a channel cross-sectional area in a channel.

[4] The extracorporeal blood circulating apparatus according to any one of claims 1 to 3, comprising a measuring portion for measuring an amount of the adjusting liquid that is stored in the adjusting liquid tank.

[5] The extracorporeal blood circulating apparatus according to any one of claims 1 to 4, wherein the closed-type venous reservoir comprises:
a first blockade avoiding channel forming a space bulging outward that is provided on an inner wall surface of the housing at a part facing the blood storage chamber; and
the inflow port and the outflow port that respectively are disposed so as to communicate with the first blockade avoiding channel.

[6] The extracorporeal blood circulating apparatus according to any one of claims 1 to 5, comprising a fine-adjusting port for injecting and ejecting the adjusting liquid between the adjusting port and the adjusting liquid tank.

[7] The extracorporeal blood circulating apparatus according to any one of claims 1 to 6, comprising:
an auxiliary venous reservoir for collecting blood that is removed from parts other than a blood removal part of a living body; and
a blood ejecting device for allowing the blood that is stored in the auxiliary venous reservoir to inflow into the inflow port of the closed-type venous reservoir.

[8] The extracorporeal blood circulating apparatus according to any one of claims 1 to 7, comprising a supporting unit holding the adjusting liquid tank so that a height of the adjusting liquid tank can be varied.

[9] A closed-type venous reservoir comprising:

a housing forming a closed space;

a blood storage chamber for storing blood and a volume adjusting chamber for storing an adjusting liquid for volume adjustment that are

5 disposed adjacently by partitioning the closed space;

an inflow port for allowing blood to inflow and an outflow port for allowing blood to outflow that are provided at the housing so as to communicate with the blood storage chamber; and

an adjusting port for injecting and ejecting the adjusting liquid that is
10 provided at the housing so as to communicate with the volume adjusting chamber,

wherein

the closed space is partitioned by a flexible septum member into the blood storage chamber and the volume adjusting chamber,

15 a first blockade avoiding channel forming a space bulging outward is provided on an inner wall surface of the housing at a part facing the blood storage chamber; and

the inflow port and the outflow port are disposed so as to communicate with the first blockade avoiding channel.

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[10] The closed-type venous reservoir according to claim 9, wherein

a second blockade avoiding channel forming a space bulging outward is provided on the inner wall surface of the housing at a part facing the volume adjusting chamber, and

25 the adjusting port is disposed so as to communicate with the second blockade avoiding channel.

[11] The closed-type venous reservoir according to claim 9 or 10, wherein an air vent port is provided so as to communicate with the first blockade
30 avoiding channel.

[12] The closed-type venous reservoir according to any one of claims 9 to 11, wherein a gas-liquid separator membrane that encloses the inflow port and the air vent port so as to separate the inflow port and the air vent port from the blood storage chamber is disposed at a part where the inflow port is connected to the blood storage chamber.

[13] The closed-type venous reservoir according to any one of claims 9 to 12, wherein a pressure measuring port is provided so as to communicate with the second blockade avoiding channel.

[14] The closed-type venous reservoir according to any one of claims 9 to 13, wherein the first blockade avoiding channel is formed into a groove shape along the housing.

[15] An extracorporeal blood circulating method comprising:
using the extracorporeal blood circulating apparatus according to claim 1;
connecting the inflow port of the closed-type venous reservoir to a blood removal part of an living body directly or via another member;
connecting an outlet of the blood pump to an autotransfusing part of the living body directly or via another member;
filling a system comprising the adjusting liquid tank, the conduit and the volume adjusting chamber with the adjusting liquid;
adjusting a filling amount of the adjusting liquid in the volume adjusting chamber by adjusting a height of the adjusting liquid tank with respect to the closed-type venous reservoir so that the blood storage chamber has a blood storage capacity appropriate for priming before starting the extracorporeal blood circulation;
closing a channel of the conduit member after completing the

adjustment so as to start the priming by operating the blood pump; and
releasing the channel of the conduit member and holding the
adjusting liquid tank in a position, with respect to the blood removal part of
the living body, that is lower than a height of the adjusting liquid tank during
5 the priming so as to start blood removal, after completing the priming.

[16] The extracorporeal blood circulating method according to claim 15,
further comprising:
using a flexible tube as the conduit member; and
10 closing the channel of the conduit member by narrowing a bore of the
tube by a clamp.

[17] The extracorporeal blood circulating method according to claim 15,
further comprising changing the height of the adjusting liquid tank to be in a
15 higher position with respect to the blood removal part of the living body so as
to increase a blood storage capacity of a heart of the living body, during the
blood removal.

[18] The extracorporeal blood circulating method according to claim 15,
20 further comprising decreasing a cross-sectional area of a channel that
connects the inflow port of the closed-type venous reservoir and the blood
removal part of the living body, so as to increase a capacity of a heart of the
living body, during the blood removal.

25 [19] The extracorporeal blood circulating method according to claim 15,
further comprising:
decreasing the height of the adjusting liquid tank with respect to the
living body to be lower than the height of the adjusting liquid tank during the
blood removal so as to decrease a volume of the blood storage chamber to be
30 sufficient for maintaining a cross-sectional area of a blood channel;

operating the blood pump in a state of decreasing a discharging amount; and thereafter
terminating the extracorporeal blood circulation.

5 [20] The extracorporeal blood circulating method according to claim 15,
further comprising:

providing a fine-adjusting port for injecting and ejecting the adjusting liquid between the adjusting port and the adjusting liquid tank; and

10 injecting and ejecting the adjusting liquid by using a syringe via the
fine-adjusting port so as to fine-adjust a filling amount of the adjusting liquid
in the volume adjusting chamber.